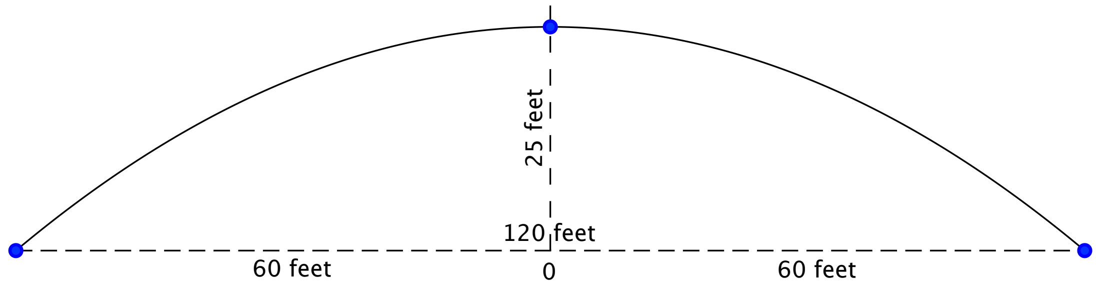
Section 2.6, problem 14: Consider the diagram below



The vertex of the parabola is 25 feet above the horizontal axis, and we may assume that it is on the vertical axis (because we choose the coordinate system), so the vertex is at the point $(0, 25)$.

The span of the arch is 120 feet, so because of symmetry, the parabola touches the ground (the horizontal axis) 60 feet away on either side of the center, which is at 0. This means that the zeros of the quadratic function whose graph is the arch are ± 60.

From the zeros, we conclude that equation of the parabola has the form

$$f(x) = a(x - 60)(x + 60),$$

and since $f(0) = 25$, it follows that

$$25 = f(0) = a(0 - 60)(0 + 60) = -3600a \implies a = -\frac{25}{3600} = -\frac{1}{144}.$$

Therefore the equation of the parabola is

$$f(x) = -\frac{1}{144}(x - 60)(x + 60).$$

Finally, the heights at 10, 20 and 40 feet away from the center are (in feet)

$$f(10) = -\frac{(10 - 60)(10 + 60)}{144} \approx 24.3, \quad f(20) = -\frac{(20 - 60)(20 + 60)}{144} \approx 22.22$$

and

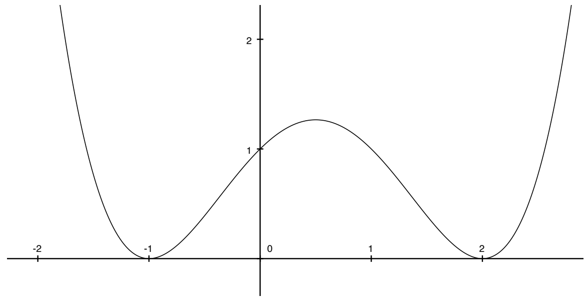
$$f(40) = -\frac{(40 - 60)(40 + 60)}{144} \approx 13.89.$$

Section 3.1, problem 26: Yes — the function

$$G(x) = -3x^2(x + 2)^3 = -3x^5 - 18x^4 - 36x^3 - 24x^2$$

is a polynomial of degree 5.

Section 3.1, problem 62: The graph



could be the graph of a degree 4 polynomial with real zeros $r_1 = -1$ (of multiplicity 2) and $r_2 = 2$ (also of multiplicity 2). In fact this could be the graph of

$$f(x) = \frac{1}{4}(x+1)^2(x-2)^2.$$